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Does vacuum packaging retain the quality of hilsa fish (*Tenualosa ilisha*) during long-term frozen storage?

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BACKGROUND

- Hilsa fish (*Tenualosa ilisha*) having geographical indicator of Bangladesh is known as the king of fish for its delicious taste and unique flavors.
- The 60% of the world's hilsa catch comes from Bangladesh with total production of 0.52 Million MT in 2017-2018.
- Hilsa fishes are traded in the domestic market as a fresh, whole and without dressing and with adding ice.
- Freezing and subsequent frozen storage are also practiced to keep the hilsa fish for a longer period.
- However, this long-term frozen storage deteriorates hilsa quality due to oxidation of lipid and disintegration of myoglobin along the lateral line.
- As a result, a foul smell is produced, which makes hilsa fish unfit for consumption.
- Vacuum packaging could be an effective intervention during frozen storage to retain the flavor and quality of hilsa fish.

OBJECTIVES

- To know the effects of vacuum packaging on the quality of hilsa fish under frozen storage condition

MATERIALS & METHODS

Sample Collection and preparation:

- Hilsa shad (*Tenualosa ilisha*) was collected from Chandpur and brought to the Dept. of Fisheries, University of Rajshahi, Bangladesh under icing condition.
- Fishes were prepared as whole & dressed.

Packaging of fish:

- Four types of packaging were used as treatments;
  - (a) whole without pack;
  - (b) whole with vacuum pack;
  - (c) dressed without pack;
  - (d) dressed with vacuum pack.
- Vacuum packaging was done in a multilayer plastic pouch (PE/PA/PE) using a packaging machine (Multivac C100, Germany).
- All packed samples were kept separately in frozen storage at -18°C for one year.

Biochemical and microbiological:

- The fishes were subjected to biochemical and microbiological analysis at 30 days interval during frozen storage in laboratory.
- Fishes were thawed for about 18-20 h before analysis.
- The following analysis were done:
  - P[H] (Binsi *et al.*, 2015)
  - Free fatty acid (FFA) (AOAC, 1980)
  - Total volatile base nitrogen (TVB-N) (EC, 2005)
  - Thiobarbituric acid reactive substances (TBARS) (Park *et al.* , 2007)
  - Aerobic plate count (APC) (APHA, 1992)

Statistical analysis: It was done by one-way ANOVA with Tukey test using SPSS Version 20 at $P < 0.05$ level of significance.

RESULTS

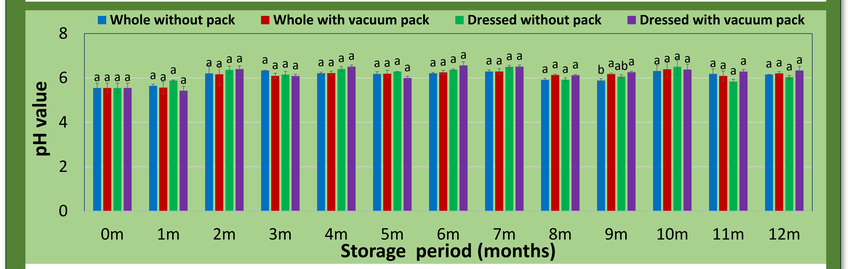

Fig. 1. Changes in pH value of hilsa fish under different packaging conditions at frozen storage (n=3)

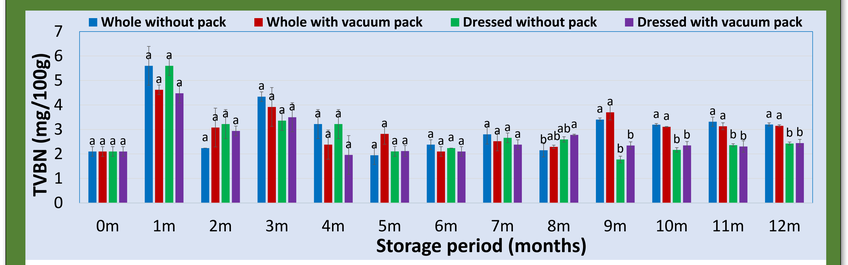

Fig. 2. Changes in total volatile base nitrogen (TVB-N) value of hilsa fish under different packaging conditions at frozen storage (n=3)

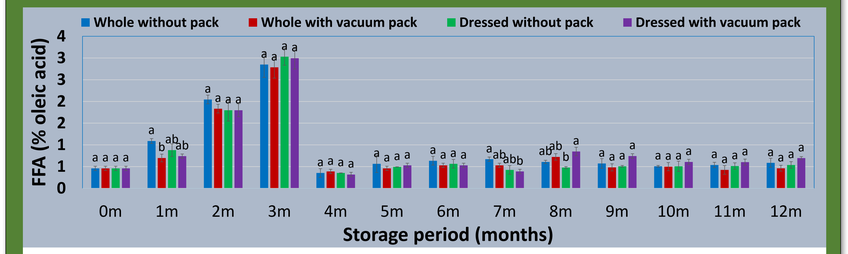

Fig. 3. Changes in free fatty acid (FFA) value of hilsa fish under different packaging conditions at frozen storage (n=3)

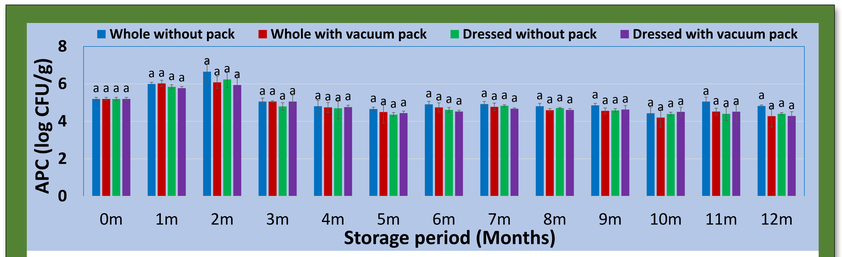

Fig. 4. Changes in aerobic plate count (APC) of hilsa fish under different packaging conditions at frozen storage (n=3)

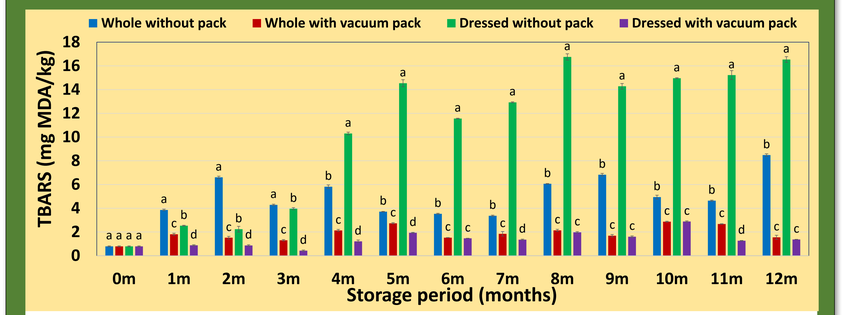

Fig. 5. Changes in thiobarbituric acid reactive substances (TBARS) value of hilsa fish under different packaging conditions at frozen storage (n=3)

*Note: Fig. 1-5: Different letters on the top of the bars of each month represent a significant difference among the treatments ($p < 0.05$).

CONCLUSIONS

- There was no such significant difference ($p > 0.05$) in pH, FFA, TVB-N, and APC values among treatments in the storage period (Fig. 1-4).
- The pH (6.8-7), FFA (5% oleic acid), TVB-N (30-35 mg/100g), and APC (7 log CFU/g) value of all samples did not exceed the acceptable limit in the entire storage period (Fig. 1-4).
- TBARS values were significantly ($p < 0.05$) lower in vacuum pack samples (whole & dressed) compared to without pack (Fig. 5).
- TBARS values did not cross the acceptable limit (2 mg MDA/kg) for vacuum pack samples in almost the entire storage but exceeded in the first month for without pack samples (Fig. 5).
- It is assumed that the vacuum packaging reduced the secondary oxidation of fatty fish like hilsa during the storage period which responsible for the rancid odor of long-term frozen stored hilsa.
- Therefore, vacuum packaging can be used with freezing for year-round supply of quality hilsa fish without changing the unique taste and flavor.

ACKNOWLEDGEMENT

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